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10/657,944	09/09/2003	Hiroyuki Nakamura	MTS-3462US	1606

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EXAMINER

SUMMONS, BARBARA

ART UNIT

PAPER NUMBER

2817

DATE MAILED: 11/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/657,944

Applicant(s)

NAKAMURA ET AL.

Examiner

Barbara Summons

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 September 2003 (pre-amendment).
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-26 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-26 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 9/903 & 2/20/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Specification*

1. The abstract of the disclosure is objected to because it must be one paragraph. Correction is required. See MPEP § 608.01(b).

2. The disclosure is objected to because of the following informalities: In the amendment received 9/9/03, on line 10 of the paragraph replacing the paragraph beginning on page 17, line 10, note that "potted" should be -- plotted --. Appropriate correction is required.

### *Claim Objections*

3. Claims 2, 17, 18, 20, 22, 23 and 24 are objected to because of the following informalities:

In claim 2, on line 2, both occurrences of "resonator" should be changed to the plural -- resonators --, and "is a" should be changed to -- are -- (see claim 1, line 2).

Similarly, in claim 17, on line 2, both occurrences of "resonator" should be changed to the plural -- resonators --, and "is a" should be changed to -- are --.

Also, in claim 18, on line 2, both occurrences of "resonator" should be changed to the plural -- resonators --, and "is a" should be changed to -- are --.

In claim 20, on line 2, "resonator" should be the plural -- resonators --.

In claim 20, also on line 2, the claim needs to be more specific about which of the "plurality of...resonators" (claim 1, line 2) has the electrodes that form the reactance element, for example, -- at least one of said bulk acoustic wave resonators --.

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-In claim 22, on line 2, it appears that a word or words is/are missing between "grounded" and "wiring". Or perhaps "is" should be -- have --?

In claim 23, on line 2, the Examiner suggests changing "an" to -- another -- to clearly differentiate the reactance element resonator from the previously recited resonators.

Claim 24 is objected to as being not further limiting since a "band elimination filter" is a "filter device". That is claim 24 adds no discernable structure to claim 1. Appropriate correction is required.

***Claim Rejections - 35 USC § 112***

4. The following is a quotation of the second paragraph of 35 U.S.C. § 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claim 21 is rejected under 35 U.S.C. § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 21 recites the limitation "said surface acoustic wave resonators" which lacks antecedent basis in the claims. Should claim 21 correctly depend from claim 2?

***Claim Rejections - 35 USC § 102***

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. § 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

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(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

7. Claims 1-10, 13, 14, 16, 17, 22, 24 and 26 are rejected under 35 U.S.C. § 102(b) as being anticipated by Satoh et al. U.S. 6,404,302.

Regarding claims 1, 2 and 24, Fig. 1 of Satoh et al. discloses a band elimination filter device (see e.g. col. 2, line 58 through col. 3, line 2) comprising: a plurality of acoustic resonators being surface acoustic wave (SAW) resonators 11-13 on a piezoelectric substrate (see col. 4, lines 36-40) each having one end grounded; a transmission line between the input/output terminals 16 and 17 to which the other end of each of the plurality of acoustic resonators is connected; wherein at least some of the other ends of the resonators are coupled to the transmission line at predetermined intervals; and wherein at least one reactance element being line 14a or 15a is provided on the transmission line in all of the predetermined intervals.

Regarding claims 5 and 7-10, the reactance element transmission line 14a may be transformed into the circuit elements of an inductor 32 (see Fig. 3A), capacitor 31 (see also col. 3, lines 57-59 for a series capacitor), a parallel circuit of a capacitor 32b (Fig. 3C) and an inductor 32a, or a series circuit of capacitor 31a (Fig. 3B) and an inductor 31b.

Regarding claims 3 and 4, the transmission lines have an optimized impedance and electrical length (see col. 5, lines 11-14 and col. 6, lines 5-8 and 38-41) and so may

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take varying impedances such as 66 or 67 Ohms (see col. 5, line 66 and col. 6, line 34) that with the characteristic impedance of 50 Ohms (see col. 7, lines 35-36), provides a normalized impedance of the reactance element with the characteristic impedance of  $66/50 = 1.32$  being higher than 1.0 and lower than 1.5.

Regarding claims 13 and 14, see Fig. 9, which shows the reactance elements 95a and 95b formed in a mounting substrate. Regarding claim 6, the bonding wires and via holes 99 shown in Fig. 9 inherently contribute an inductance/reactance element in addition to the lines 95a and 95b that must be taken into account when optimizing the transmission line circuits shown in Figs. 3A-3C. Regarding claims 16 and 22, as can be seen in Fig. 9 three separate bonding wires 98, being the three at the top in the figure, are used to connect the three resonators to ground indicating that the resonator grounds are separate on the piezoelectric substrate, since if they were not separate only one bonding wire to ground would be required. Regarding claim 17, a SAW resonator is considered a "piezoelectric" resonator since it is formed on a piezoelectric substrate that supports the propagation of the SAWs. Regarding claim 26, Satoh et al. discloses using its filter in a cellular phone (see e.g. the abstract, lines 1-3) communication apparatus that inherently includes "transmission means" and "receiving means", the filter necessarily being used in one of the transmission and/or receiving means.

8. Claims 1, 2, 12, 17-20 and 23-26 are rejected under 35 U.S.C. § 102(e) as being anticipated by Beaudin et al. U.S. 6,710,677.

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Regarding claims 1, 2, 17-19 and 24, Fig. 1 of Beaudin et al. discloses a band elimination filter (see the Title) device comprising: a plurality of acoustic resonators PR10 and PR12 each having one end grounded (see col. 4, line 54), and which may be SAW resonators or thin film bulk acoustic wave resonators (FBARs)[see col. 4, lines 16-20]; a transmission line between input/output terminals 6 and 8 to which the other end of each of the plurality of acoustic resonators is connected; wherein at least some of the other ends are coupled to the transmission line at predetermined intervals; and wherein at least one reactance element SR4 is provided on the transmission line in all or at part of the predetermined interval.

Regarding claim 23, the reactance element SR4 is an acoustic resonator having a resonance frequency different from the resonance frequencies of the acoustic resonators PR10 and PR12 by a predetermined amount because the resonance frequencies of PR10 and PR12 are in the reject band (see col. 4, lines 61-64) while the resonance frequency of SR4 is in the pass band that is lower than the reject band (see col. 5, lines 3-6). Regarding claims 12 and 20, because the reactance element is an acoustic resonator it must be formed on a piezoelectric substrate if it is a SAW resonator or it is formed using the electrodes of a bulk acoustic wave resonator when it is a bulk acoustic wave resonator. Regarding claims 25 and 26, the band elimination filter device is disclosed as used in an antenna duplexer (see col. 3, lines 64-66) in a mobile telephone handset (Fig. 4) which inherently has a transmission filter and a receiving filter (col. 6, lines 1-5), the band elimination filter being used as the transmission filter (col. 6, lines 15-18), and the communication apparatus can be the

base station shown in Fig. 3 wherein the band elimination filter can be used as filters 36 and 28.

9. Claims 1, 2, 12, 16, 17, 21-26 are rejected under 35 U.S.C. § 102(b) as being anticipated by Yuda et al. JP 10-065490.

Regarding claims 1, 2, 17 and 24, Fig. 1 of Yuda et al. discloses a band elimination filter (see the Title) device comprising: a plurality of acoustic resonators 2 and 4 being piezoelectric SAW resonators having one end grounded; a transmission line between the input/output terminals to which the other end of each of the plurality of SAW resonators is connected; wherein at least some of the other ends are coupled to the transmission line at predetermined intervals; and wherein at least one reactance element being a SAW resonator 3 is provided on the transmission line in all or part of the predetermined intervals.

Regarding claims 12, 16 and 22, since the reactance element is a SAW resonator 3, it is formed on the piezoelectric substrate as shown in Fig. 4, and the grounds 10 and 11 of SAW resonators 2 and 4, respectively are separated on the piezoelectric substrate as can also be seen in Fig. 4.

Regarding claim 21, the SAW resonators 2 and 4 have different resonance frequencies  $F_{s2}$  and  $F_{s4}$  shown in Fig. 3. Regarding claim 23, the reactance element SAW resonator 3 has a resonance frequency  $F_{s3}$  different from the resonance frequencies  $F_{s2}$  and  $F_{s4}$  of the SAW resonators 2 and 4 as can also be seen in Fig. 3.

Regarding claims 25 and 26, the band elimination filter is used in an antenna duplexer communication apparatus as shown in Fig. 6.



***Claim Rejections - 35 USC § 103***

10. The following is a quotation of 35 U.S.C. § 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

11. Claims 11, 12 and 15 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Satoh et al. U.S. 6,404,302 taken alone.

Satoh et al. discloses the invention as discussed above, except for explicitly disclosing the reactance element being a chip component, or formed on a piezoelectric substrate, or the acoustic resonators being face down mounted on the mounting substrate. Satoh et al. discloses the embodiments wherein the transmission line reactance elements are replaced by concentrated constant elements including inductors and capacitors (see Figs. 3A-3C), but is silent as to the structure or location of these elements. This suggests to one of ordinary skill that any manner of providing these circuit elements would have been usable therewith.

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It would have been extremely well known in the SAW filter art that circuit elements such as inductors and capacitors can be placed either on the piezoelectric substrate, or in the package as shown in Satoh et al. Fig. 9, or be provided as chip elements externally mounted on the mounting substrate, these being all art recognized equivalent locations of the circuit elements. Similarly, it would have been extremely well known that SAW filters are mounted in either of two ways face up via bond wires or face down via bumps.

Consequently, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the SAW band elimination filter of Satoh et al. by having provided the reactance element circuit element inductors and capacitors (Figs. 3A-3C) as a chip component or on the piezoelectric substrate because Satoh et al. is silent as to the location/structure of these circuit elements, thereby suggesting to one of ordinary skill that any well known location/structure of these elements, such as on the piezoelectric substrate or as chip elements, would have been usable therewith, and such a modification also would have merely been art recognized equivalent location/structures equivalent to providing them in a mounting substrate as shown by Satoh et al. Fig. 9. It would have been further obvious to one of ordinary skill in the art at the time of the invention to have mounted the resonators face down on the mounting substrate rather than face up as shown by Satoh et al. Fig. 9, because such an obvious modification would have merely been an art recognized alternate mounting method which would have provided the advantage of miniaturization of a height of the device as would have been known by one of ordinary skill.

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**Conclusion**

12. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Dydyk U.S. 5,617,065 discloses a band elimination filter using thin film bulk acoustic wave resonators (see Figs. 2-5).

Rist et al. U.S. 4,903,297 discloses a band elimination filter using either SAW resonators or quartz piezoelectric resonators in the shunt arms and with reactance component inductors in the series arms (see Fig. 6c and col. 14, lines 42-46).

Sasaki et al. U.S. 4,910,481 discloses that it is known to use SAW band elimination filters in antenna duplexers (see Fig. 1).

13. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Barbara Summons whose telephone number is (571) 272-1771. The examiner can normally be reached on M-Th, M-Fr.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bob Pascal can be reached on (571) 271-1769. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

bs

November 3, 2004



**BARBARA SUMMONS  
PRIMARY EXAMINER**